

Claims

- [c1] 1. A multi-beam antenna, comprising:
- a. at least one curved surface;
 - b. at least one dielectric substrate; and
 - c. a plurality of antenna feed elements on said dielectric substrate, wherein at least two of said plurality of antenna feed elements each comprise an end-fire antenna element adapted to launch electromagnetic waves in a direction substantially towards said at least one curved surface, and said direction for at least one said end-fire antenna element is different from said direction for at least another said end-fire antenna element.
- [c2] 2. A multi-beam antenna as recited in claim 1, wherein at least one of said at least one curved surface is adapted to substantially reflect at least some of said electromagnetic waves.
- [c3] 3. A multi-beam antenna as recited in claim 1, wherein at least one of said at least one curved surface is metallic.
- [c4] 4. A multi-beam antenna as recited in claim 1, wherein at least one of said at least one curved surface is substan-

tially circular in a first cross section along an intersection with a reference surface parallel to said dielectric substrate along said plurality of antenna feed elements.

[c5] 5. A multi-beam antenna as recited in claim 4, wherein at least one of said at least one curved surface is substantially parabolic in a second cross section that is substantially normal to said first cross section.

[c6] 6. A multi-beam antenna as recited in claim 1, wherein at least one of said at least one curved surface is substantially spherical.

[c7] 7. A multi-beam antenna as recited in claim 1, wherein at least one of said at least one curved surface is substantially cylindrical.

[c8] 8. A multi-beam antenna as recited in claim 1, wherein at least one of said at least one curved surface comprises an optical reflector.

[c9] 9. A multi-beam antenna as recited in claim 8, wherein said optical reflector comprises a reflector of a light assembly.

[c10] 10. A multi-beam antenna as recited in claim 9, wherein said at least one dielectric substrate is located within said light assembly.

- [c11] 11.A multi-beam antenna as recited in claim 10, wherein said at least one dielectric substrate is adapted to operatively associate with at least one source of light of said light assembly.
- [c12] 12.A multi-beam antenna as recited in claim 11, wherein said at least one source of light comprises a plurality of sources of light, and at least two of said plurality of sources of light are operatively associated with different sides of said at least one dielectric substrate.
- [c13] 13.A multi-beam antenna as recited in claim 9, wherein said light assembly comprises a vehicle headlight assembly.
- [c14] 14.A multi-beam antenna as recited in claim 1, wherein at least one of said at least one curved surface is substantially refractive of at least some of said electromagnetic waves.
- [c15] 15.A multi-beam antenna as recited in claim 1, wherein at least one of said at least one curved surface is substantially diffractive of at least some of said electromagnetic waves.
- [c16] 16.A multi-beam antenna as recited in claim 1, wherein at least one of said at least one curved surface is dielec-

tric.

- [c17] 17.A multi-beam antenna as recited in claim 1, wherein at least one of said at least one curved surface is a surface of an electromagnetic lens.
- [c18] 18.A multi-beam antenna as recited in claim 1, wherein said direction of at least one said end-fire antenna element is substantially aligned with a radius of curvature of said at least one curved surface.
- [c19] 19. A multi-beam antenna as recited in claim 18, wherein said direction of at least one said end-fire antenna element is substantially co-incident with said radius of curvature of said at least one curved surface.
- [c20] 20. A multi-beam antenna as recited in claim 1, wherein each said antenna feed element comprises at least one conductor operatively connected to said dielectric substrate.
- [c21] 21. A multi-beam antenna as recited in claim 19, wherein said dielectric substrate comprises a dielectric of a printed circuit
- [c22] 22.A multi-beam antenna as recited in claim 1, wherein said at least one dielectric substrate is substantially planar.

- [c23] 23. multi-beam antenna as recited in claim 1, wherein said end-fire antenna is selected from a Yagi-Uda antenna, a coplanar horn antenna, a Vivaldi antenna, a tapered dielectric rod, a slot antenna, a dipole antenna, and a helical antenna.
- [c24] 24. multi-beam antenna as recited in claim 1, further comprising at least one transmission line on said dielectric substrate, wherein at least one said at least one transmission line is operatively connected to a feed port of one of said plurality of antenna feed elements.
- [c25] 25. multi-beam antenna as recited in claim 24, wherein said transmission line is selected from a stripline, a microstrip line, an inverted microstrip line, a slotline, an image line, an insulated image line, a tapped image line, a coplanar stripline, and a coplanar waveguide line.
- [c26] 26. multi-beam antenna as recited in claim 1, further comprising a switching network having an input and a plurality of outputs, said input is operatively connected to a corporate antenna feed port, and each output of said plurality of outputs is connected to a different antenna feed element of said plurality of antenna feed elements.
- [c27] 27. multi-beam antenna as recited in claim 24, further

comprising a switching network having an input and a plurality of outputs, said input is operatively connected to a corporate antenna feed port, and each output of said plurality of outputs is connected to a different antenna feed element of said plurality of antenna feed elements via said at least one transmission line.

[c28] 28. multi-beam antenna as recited in claim 26, wherein said switching network is operatively connected to said dielectric substrate.